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## C-A OPERATIONS PROCEDURES MANUAL

### 9.5.5 ALARA Job Review

Text Pages 2 through 6

#### Hand Processed Changes

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Approved: \_\_\_\_\_ [Signature On File](#) \_\_\_\_\_  
Collider-Accelerator Department Chairman Date

C. Schaefer

### **9.5.5 ALARA Job Review**

#### **1. Purpose**

The purpose of this procedure is to provide C-A personnel with a method for performing a systematic As Low As Reasonably Achievable (ALARA) job review to ensure that radiation exposure and contamination controls are incorporated as a part of routine planning and performance of work.

#### **2. Responsibilities**

- 2.1 ALARA Committee - The Committee that is responsible for reviewing and advising management on the implementation of the ALARA program. Committee members review exposure reduction plans for specific jobs with significant potential for radiological impact.
- 2.2 Facility Support (FS) Representative - A staff position within the Radiological Controls Division. The FS Representative is responsible for providing technical support and assistance to supervisors, planners, schedulers, physicists, and engineers in order to reduce dose and the spread of radioactive materials.
- 2.3 ALARA or Radiological Control Coordinator - A designated supervisor, planner, or engineer who is responsible for conducting ALARA activities within his/her own Department or project and for coordinating these activities with other Departments.
- 2.4 Job Planner - The individual who is responsible for planning and coordinating a maintenance, production, construction, or research activity. This individual may or may not be the Work Supervisor.
- 2.5 Work Supervisor - The job supervisor or foreman who is directly responsible for overseeing the work being performed.

#### **3. Prerequisites**

- 3.1 If the initial exposure estimate obtained on the Radiation Work Permit (RWP) is  $< 0.75$  person-rem, pre-planning may be limited to that which is normally performed. This pre-planning would involve documenting any exposure controls and contamination controls to be implemented during performance of the job. Notations shall be made on the appropriate sections of the RWP.
- 3.2 If the initial estimate for exposure is  $\geq 0.75$  person-rem, the actions in Section 5.0

shall be taken in the order specified. Specifically, this procedure shall be followed if:

- 3.2.1 A non-routine maintenance or repair project in C-A facilities (e.g., the Linac, TTB line, AGS Ring, Booster Ring, or primary beam line) results in a pre-job estimate that is  $\geq 0.75$  person-rem exposure.
- 3.2.2 Installation, operation, or routine maintenance of an accelerator system, or beam-line component results in 0.75 person-rem or greater.
- 3.2.3 Scheduled replacement, removal or rebuilding an existing beam-line component or accelerator system results in  $\geq 0.75$  person-rem.

#### **4. Precautions**

- 4.1 The procurement and use of radioactive material (including accountable sealed sources) shall be in accordance with HP-SOP-026 (reference 7.1). Individuals will not be permitted to receive radioactive material unless they are qualified.

#### **5. Procedure**

##### **Pre-Job**

- 5.1 The Job Planner with the assistance of the Department ALARA Coordinator, shall complete a comprehensive person-hour estimate for the job or experiment, broken down by individual tasks. The RWP is to be used to document this data ([see C-A-OPM 9.5.4](#)).
- 5.2 The Job Planner should review and note any reasonable ALARA controls using a list of ALARA methods and work practices (see Attachment 8.2 for examples). The FS Representative and the ALARA Coordinator shall review the person-hour estimates and review the list of ALARA methods and work practices.
- 5.3 A pre-job planning meeting with the ALARA Committee Chairman, or designee, must be held. The following action shall be taken:
  - 5.3.1 A meeting of the appropriate personnel involved in planning and performing the job must be held to review radiation dose rates and radioactive contamination levels anticipated for the job.
  - 5.3.2 Those attending the meeting shall review the exposure estimates and the list of ALARA methods and work practices and concur on the exposure and contamination controls to be applied. If deemed appropriate, the results of the ALARA job review shall be taken before the ALARA

Committee. In either case, the ALARA Committee Chairman or designee, shall sign the RWP after the appropriate review is complete.

- 5.3.3 The FS Representative shall approve all RWPs with estimated collective dose >0.75 person-rem.
- 5.3.4 Actual work in radiological areas is authorized when work planning reviews are complete.

#### During the Job

- 5.4 During the job performance, the Work Supervisor should:
  - 5.4.1 Ensure that all workers are:
    - 5.4.1.1 briefed on the work to be performed,
    - 5.4.1.2 aware of special tools, procedures, RWP requirements, ALARA controls, and
    - 5.4.1.3 possess special training as required.
  - 5.4.2 Ensure that the RWP requirements and ALARA controls are implemented.
  - 5.4.3 Make the Radiological Control Technician (RCT) providing job coverage, FS Representative and ALARA Coordinator aware of ALARA controls which are not implemented or are not effective, and any changes in scope of work.
  - 5.4.4 Recommend additional tools, procedures, and ALARA controls that may be considered more effective.
  - 5.4.5 Periodically review the accumulation of actual dose for the job based upon the exposure tracking system in use. When a review of the remaining projected dose plus accumulated dose reveals an expectation value that exceeds the pre-job estimate by > 25% or more, radiological conditions and work methods should be reviewed. The Work Supervisor, together with the FS Representative shall identify the cause(s) and corrective action(s) taken, and compute a new estimate of the person-rem goal in order to complete the work.
- 5.5 During the job, the Radiation Workers should:
  - 5.5.1 Monitor their own exposure and minimize their dose.

- 5.5.2 Observe all radiological postings, RWP requirements, ALARA controls, and verbal instructions from the RCT.
- 5.5.3 Report any radiological problems in the design, maintenance, procedures, conditions, production or operations that occur to the Work Supervisor.
- 5.6 During the job, the RCT shall enforce the RWP requirements and ALARA controls and be alert for further opportunities for reducing exposure and changing radiological conditions.
- 5.7 The Work Supervisor, RCT, or the FS Representative may stop the job whenever:
  - 5.7.1 radiological conditions or practices could or have jeopardized personnel or environmental safety, or
  - 5.7.2 continuing the job would otherwise violate safety policy, orders, or procedures.
- 5.8 When stop work actions occur, the appropriate Work Supervisor, RCT, and FS Representative should be notified. Stop work actions and subsequent changes in job controls shall be documented on the RWP.
- 5.9 The RCT, FS Representative and the Work Supervisor, should record significant problems, effectiveness of ALARA controls, changes in work scope, as well as any lessons learned and ideas for future improvements. The FS Representative should ensure that sufficient data on radiological surveys and personnel exposure are incorporated into the RWP to permit reconstruction and review of the ALARA efforts at a later date.

#### Post-Job Review by the FS Representative

- 5.10 The FS Representative should perform a post-job review for each job with actual expended dose equal to or greater than 0.75 person-rem. This review should be completed as soon as practicable after the completion of the job. The review should include the following items:
  - 5.10.1 Compare the actual man-hours and person-rem to the pre-job estimates, and identify reasons for significant differences.
  - 5.10.2 Identify deviations from the original scope, including any planned ALARA controls that were not implemented and the reasons why.
  - 5.10.3 Evaluate the relative success or failure of the list of ALARA methods and

work practices implemented from the RWP ALARA Controls Plan.  
Estimates of dose-rate reduction factors, decontamination factors, and/or exposure savings should be quantified and documented.

5.10.4 Document conditions that result in a work stoppage.

5.10.5 Participate in post-job review meetings when appropriate.

## **6. Documentation**

- 6.1 The post-job review shall be documented by the FS Representative in accordance with the site-wide RWP procedure (reference 7.2)
- 6.2 The appropriate personnel involved in planning and performing the job shall complete the list of ALARA methods and work practices. [C-A-OPM-ATT 9.5.5.b](#) the list of ALARA methods and work practices shall be documented using an RWP-ALARA Controls Plan (see [C-A-OPM-ATT 9.5.5.a](#)). This record shall be included with the RWP.
- 6.3 Any recommendations from the ALARA Committee review shall be recorded in meeting minutes, and on the RWP-ALARA Controls Plan (see [C-A-OPM-ATT 9.5.5.a](#))

## **7. References**

- 7.1 BNL procedure HP-SOP-026, Procurement of and Approval to Use Radioactive Material
- 7.2 FS-SOP-4031, Radiological Work Permit
- 7.3 BNL Procedure HP-SOP-009, ALARA Optimization
- 7.4 [C-A-OPM 9.5.4. "Radiation Work Permit"](#)

## **8. Attachments**

- 8.1 [C-A-OPM-ATT 9.5.5.a "RWP-ALARA Controls Plan"](#)
- 8.2 [C-A-OPM-ATT 9.5.5.b "Examples of specific ALARA Work Practices"](#)